

lation, of 857 feet above the sea. This would give to the red sandstone cliffs an elevation of something under 2,000 feet, which is a not unusual elevation for the Hawkesbury rocks in New South Wales. It might be added, that those who would argue that these rocks are a member of the Triassic group, would find confirmation in the fact, that on the Castlereagh River, about 600 miles to the southward, the formation is *saliferous*, and coal underlies it there. My sole object in noticing these facts, is to place the subject clearly before the reader, without venturing on any further conclusions as to formations, the extreme points of which (as far as the localities mentioned in this paper are concerned) between Portland Bay and the Comet River, being fully 1100 miles.

ART. XIV.—*Remarks on a Series of Fossils collected at Wollumbilla, and transmitted by Rev. W. D. Clarke, of Sydney.* By PROFESSOR M'COY.

[Read 30th December, 1861.]

Having been honoured by His Excellency Sir Henry Barkly with a request that I should examine a series of fossils recently collected at Wollumbilla, and forwarded to the Rev. W. B. Clarke, of Sydney, who transmitted them to His Excellency with the expression of a desire that I should indicate the age of the rocks from which they were obtained, I subjoin a rough list of the specimens, of which, however, I have not written specific descriptions, as I understand Mr. Clarke desires himself to publish some of the species, and to send all the specimens home. It would also be necessary before describing any of them to clear away adhering matrix at present obscuring some of the characters, and running a certain amount of risk of damaging the specimens for which I had no authority.

I can, however, with confidence pronounce, from the

* Stutchbury. Report of 1st January, 1853. Nevertheless in his report of 1st August, 1854, Mr. S. says, "I now feel justified, from the examination of so large a portion of the colony, to record my opinion in favour of the views so strenuously advocated by the Rev. W. B. Clarke, of the more ancient geological age of the coal-bearing strata than that assigned to it by several high authorities in England," &c.

palæontological evidence, on the general geological age of the deposits, which is the main point on which my opinion is asked. The great interest attaching to these fossils is, that they enable me to state, for the first time, the existence of a distinctly-marked *Mesozoic marine fauna in Australia*. This it will be remembered has a very interesting bearing on the question at issue between the Rev. Mr. Clarke and myself, as to the age of the Australian coal deposits, which, from the abundance of *Zamites*, *Tæniopteris*, *Glossopteris*, and other Mesozoic plants, and the total absence in the same beds of the *Calamites*, *Lepidodendron*, *Sigillaria*, *Stigmaria*, &c., so characteristic of Palæozoic coal-fields, I always maintained to have been of the Mesozoic age, like the Oolitic coal-fields of Yorkshire, the Liassic coal-fields of Theta, and the Triassic plant beds of many parts of Germany; in opposition to which Mr. Clarke's most striking argument hitherto was that it was unlikely so rich a Mesozoic flora could exist in a country in which no marine Mesozoic fossils had yet been found. In a former paper to the Royal Society of Victoria, I answered this argument of Mr. Clarke, by referring to the exactly similar circumstances of the Mesozoic coal-field of Richmond, in Virginia. I have now the great pleasure of stating, as a more forcible argument, that the *series of animal fossils from Wollumbilla clearly indicates a marine deposit of exactly the same age as that to which I have for the last fourteen years continued to refer the plant beds of the Hunter district, &c.*, in New South Wales, as well as more recently our own similar deposits at Western Port, Bellerine, and Portland, namely, to the base of the Mesozoic series, certainly not lower than the Trias, and not higher, I think, than the lower part of the great Oolite; a period as restricted as I think it is possible for us to indicate at present, when we bear in mind that some of the European Triassic plants are also found in the Lias, and some of the Liassic forms in the higher Oolitic beds, and that in the marine series of Europe of the same dates several Liassic animal fossils are found in the Inferior Oolite, and several Inferior Oolite, *Mullusca*, *Echinodermata*, &c., are found in the great Oolite.

By far the most interesting specimen is that to which the name *Belemnites Barklyi* has been assigned, No. 39, a large species, unmistakably belonging to the genus *Belemnites*, and most nearly related to the gigantic species of the lower Oolite and Lias of Europe, but which cannot be fully

characterised from the present specimen, as all the posterior portion of the guard is broken away. The occurrence of several joints of the column of a true *Pentacrinus* in these same rocks is also of high interest. The distinctly-marked quinquepetalloid arrangement of the articulated crenulations would of themselves have been sufficient, if we had only this specimen, no bigger than a pea, to prove that the deposits were not Palæozoic; the articulating crenulations in the pentagonal columns occurring in Palæozoic rocks being simply arranged in one series round the margin. The general aspect or facies of the *Serpulæ*, *Brachiopoda*, *Limæ*, &c., is exactly that of those of the base of the Oolite and Lias beds, while some of the *Monotis* recal the Saliferean beds of Germany.

Perhaps one of the most interesting points in my examination of these fossils is my detection of Professor Bronn's genus *Myaphoria* (Nos. 23, 24, 29), so abundant in the Muschelkalk of Germany, strengthening my general reference of the whole to the base of the Mesozoic series, as well as suggesting for the first time the existence of the Muschelkalk in Australia—the only European formation absent in England.

Three fossils, on the card marked 50 Mantuan Downs, sent with the others, and having a Wollumbilla specimen gummed on it with them, are certainly of an older geological epoch than any of the others on which I have remarked above. They cannot belong to the same formation as the other fossils with which they are mixed; they are certainly upper Palæozoic, and from their great resemblance to common European Magnesian Limestone and Zechstein species, enable me to suggest the existence of the Permian system in Australia.

LIST OF SPECIMENS FROM WOLLUMBILLA.

1. Gigantic *Serpulæ*, resembling European Oolitic species; and *Rhynchonella*, resembling *R. quinqueplicata* of the lower Oolite, and some middle Lias forms.
2. *Pentacrinus* of the true type, having the petalloid arrangement of the articulating ridges, distinguishing the Mesozoic and Cainozoic *Pentacrinites* from the pentagonal crinoid stems of the Palæozoic period. [No such form has ever occurred in a Palæozoic deposit.]
3. Various sections of shells not recognisable.

4. *Monotis* and *Pectens*, resembling Liassic species, and an apparently new genus of Lamellibranchiate Bivalve (same as 31—33.)
5. *Lingula* and *Pectens*, resembling Liassic species, and *Dentalium* like several Mesozoic and Cainozoic forms.
6. Obscure internal cast of *Myacites* or *Mæonia* (same as 30.)
7. New species of *Avicula* of the section *Meleagrina*.
8. Same as 7.
- 9.
10. Lamelliferous coral, generic characters not visible.
11. *Lima*, most nearly resembling Liassic species (same as 42), with large *Serpulæ* (same as 1).
12. Various casts of apparently new *Turbo* and *Natica*.
13. *Brachiopoda* under this number have a Palæozoic aspect, but are not with certainty referable to any known species.
14. *Rhynchonella*, resembling Oolitic species.
15. Large new *Monotis*, resembling Saliferian species.
16. *Pecten*, resembling Lias and Muschelkalk species.
17. *Monotis*, like Saliferian and Lias species.
18. Large *Monotis* (same as 20), resembling Liassic and Saliferian species.
19. *Pecten*, resembling Liassic species.
- 20 and 21. *Monotis*, (same as 18.)
22. Large *Serpulæ*, (same as 1.)
23. *Myaphoria*, a typical new species of the genus *Myaphoria*, so abundant in the Muschelkalk.
24. *Myaphoria*, (same as 23.)
- 25, 27, 28. ? *Eurydesma* or *Astartila*, imperfect casts resembling *Eurydesma Elliptica*. These three specimens are marked Fitzroy Downs, and are obviously of distinct age from the others.
- 26.
29. *Myaphoria* (same as 23 and 24.)
30. Same as 6.
31. (1) *Mæonia* or *Astartila*, imperfect cast. (2) external cast (same as 32). (3) new genus (same as 4.)
32. Lamellibranchiate Bivalve, between *Modiola* and *Pachydomus* in character, agreeing in most of the characters with the former, but having a very thick shell.
33. *Panopæa* ?
34. ? *Turbo*.
35. Indeterminate section of Lamellibranchiate shell.
- 36.
37. *Avicula* and *Monotis*, resembling liassic species.
38. ? Small *Orthoceras* (N.B. Von Hauer has described Mesozoic *Orthocetes*; but the genus is doubtful.)
39. *Belemnites*, like lower Oolite forms, but not specifically determinable from the guard being broken.
40. Fossil wood.
41. Two minute specimens, mounted on glass, forwarded as fish teeth: but as such teeth, if belonging to fish in the Mesozoic rocks, would belong to *Ganoids*, all of which have an immense profusion of bony

scales as compared with the number of the teeth, and as no traces of scales exist in any of the specimens, there is a slight improbability of their being really fish teeth. To determine the point, it would be necessary to prepare the specimens as transparent microscopic objects, to be examined for structure by a high power. My present impression is, that they may rather be the teeth-like spinules surrounding the edges of the suckers or acetabula of the long pair of arms of the animal enclosing the large *Belemnites Barkleyi*, the shell of which is found in the same rocks. The only structure which I can see in the present opaque state of the specimens is quite in accordance with this supposition; but, as before-mentioned, the specimen should be ground thin to exhibit the structure with sufficient clearness to determine the point of whether dentine tubes are really present or not.

42. *Lima*: most resembling Lias species.
43. *Arca*: form not characteristic of any geological age.
44. *Nucula*, *Rhynchronella*, and other genera, not characteristic of any geological age.
45. Thick shell, agreeing in most of the generic characters with *Modiola*, but of a new concentrically ridged species. (See 32.)
46. *Lima*: most resembling inferior Oolite and Lias species.
47. Large *Pecten*, like *P. dissimilis*, but distinct.
48. No remark.
49. Uncertain.
50. Marked, "Mantuan Downs, (1, 2, and 3)." These fossils are certainly of an older epoch, and belong to a totally distinct formation from any of the others sent with them. They are certainly Palæozoic, and as certainly belonging to the upper part of that series, suggesting the existence of the Permian system in Australia from the close resemblance which the fossils marked 1 and 2 bear to the smooth variety of the *Producta horrida* (called *Producta calva* by Sowerby), so common in the Magnesian limestone of the north of England, and the affinity of that marked 3 to the *Aulosteges* or *Stropholosa lamellosa*, equally common in the Permian Magnesian limestone of England, and the Zechstein of the same age in Germany.

FREDERICK M'COY.

14th September, 1861.
